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THE DILEMMA OF JAPANESE TECHNOLOGY TRANSFER TO DEVELOPING COUNTRIES

Summary

Technology transfer is an integral part of foreign aid -- one that is increasingly important to developing countries. It also is one of the most difficult types of economic assistance to implement. The Japanese private sector, which has the resources to transfer appropriate technologies to developing countries, lacks the incentive to do so. By contrast, the Japanese government has the incentive but not the resources to effect such transfers. Tokyo has been encouraging cooperation between foreign aid programs and private resources, but the alliance is difficult to forge.

Introduction

"Economic cooperation" is a term loaded with implications for Japanese policymakers. Japan has embraced promotion of Third World economic development as a cornerstone of its foreign policy (see JEI Report No. 43A, November 11, 1988). Since Japan's constitution prevents substantial expansion of the country's military capabilities, policymakers say that economic assistance is the single best way that Japan can "share the burden" of contributing to international economic and political stability. Foreign aid also provides the underpinning in Japan's game plan for a positive international image. Economic assistance packages often are used to smooth over international disputes -- including developing country complaints about Japanese economic activities, mounting trade tensions with the United States and U.S. demands that Japan do more to contribute to the security of the noncommunist world. By explicitly singling out economic assistance as the primary way of meeting the "international responsibilities of a surplus nation," Japan has staked its international credibility as a major power on the effectiveness of its aid program.

Thus far, Tokyo has relied on a straightforward demonstration of its commitment to foreign aid: a steady increase in the amount of money it channels to less developed countries. The Japanese government has initiated a series of aid-doubling measures to show its determination to expand disbursements. Largely due to these efforts, Japan replaced the United States as the world's largest aid donor this year.

But focusing on absolute quantities of aid can obscure other important aspects of economic assistance. For one, critics point out that the sharp appreciation of the yen since 1985 has made the dollar value of Japanese assistance soar. (The Development Assistance Committee of the Organization for Economic Cooperation and Development measures aid in dollar terms; therefore, the value of yen-denominated loans and grants is inflated when the dollar's strength wanes against the yen.) Even more important are the concerns that go beyond the mere quantitative assessment of disbursements. Critics have urged more emphasis on types, not amounts, of aid. Recognizing this problem, Japanese policymakers have pledged to improve the quality of Japanese aid -- for example, by increasing the grant component and emphasizing "basic human needs" rather than capital-intensive aid.

The issue of quality cuts to the heart of Japan's goal to convince other countries that its aid is indeed a contribution to international economic and political stability rather than merely a ploy to win markets. Intertwined with aid quality is the issue of technology transfer. Most policymakers will agree that money alone will not stimulate economic development in countries that lack the physical or social infrastructure to utilize aid effectively. To be truly effective aid must be accompanied by an effort to transfer fundamental skills and knowledge to developing countries. These transfers can be narrow in scope, such as project-specific technical training, or they can be quite broad-based, such as general educational and research support.

What is Technology Transfer?

Technical skills and knowledge have a definite link to self-sufficiency and international competitiveness. But the successful transfer of these benefits is difficult to quantify. Pledging to increase the transfer of technology to a developing country is very different from promising an increase in foreign aid. While foreign aid can be measured by the dollar (or yen) amount, it is practically impossible to measure the extent of technological expertise transferred from one country to another.

A major problem is that there is no standard definition of "technology" -- much less "technology transfer." One of the most common definitions denotes technology as the capacity to apply science to economic activities or production. This sufficiently broad interpretation ensures that "technology" means different things to different people. Nonetheless, there have been attempts to categorize those technologies that apply to Third World development. Terutomo Ozawa, writing for the United Nations Conference on Trade and Development, has classified technology into five basic types:

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Plant-embodied technology - Overall plant design and layout.

Input-embodied technology - Material inputs supplied by foreign countries.

Product/process-embodied technology - Scientific and engineering specifications, the processes used to produce profits and packaging/marketing procedures.

Human labor-embodied technology - Skills and know-how acquired through formal specifications/formulae/manuals and training/human contact.

Organization-embodied technology - Organizational efficiency, delegation of responsibilities, control of resources, ways to motivate workers and ability to attain corporate objectives.[1]

While definitions of technology may differ most agree that the actual transfer of technology has not occurred until the recipient country possesses the capability to utilize the information successfully. The mere presence of sophisticated foreign operations and personnel does not constitute technology transfer unless local personnel acquire these skills and use them independent of the foreign firm. Thus, measuring technological transfer is a tricky business. Japanese statisticians often examine inputs to measure change -- for example, the number of people trained by Japanese experts, the number of Japanese experts sent to developing countries, or the value of investment activities in LDCs. Yet these inputs may bear absolutely no relationship to whether the recipient has absorbed technical knowledge effectively.

Recipient Demands: Options for Acquiring Technology

Developing countries have four major choices in deciding how they will acquire technology.

- They can rely on foreign direct investment. This limits the recipient's independence since the foreign firm retains control of the technology brought into the country. Under this strategy the recipient must rely on the eventual diffusion of the technology from the foreign-owned firm to domestic firms; this usually occurs when local employees of foreign firms leave their jobs to work for domestic firms. To the extent that foreign firms can retain domestic employees for long periods of time, technology transfer is an extremely slow process.

- Developing countries simply can purchase technologies from industrialized countries and adapt them to their own development needs, as Japan did in its development strategy. While this option maximizes LDC control over the transfer process, it also is the least likely option for many developing countries. Capital is so scarce in many Third World countries -- especially among debt-ridden Latin American nations and the destitute countries of sub-Saharan Africa -- that the outright purchase of technology is virtually impossible.

[1]Terutomo Ozawa, International Transfer of Technology by Japan's Small and Medium Enterprises in Developing Countries (United Nations Conference on Trade and Development, 1985), pp. 18-19.

Moreover, purchased technology is unproductive unless qualified personnel are available to use it. In many developing countries, the shortage of engineers and other technical personnel renders this option impracticable.

- LDCs can acquire technology simply by studying foreign imports and adapting the technology to the specific needs of the country -- another method used by Japan. Again, this approach assumes that the recipient country has a corps of people able to "reverse engineer" foreign products. This may be true in some Asian countries (such as South Korea), but a shortage of qualified technical personnel is the rule rather than the exception.

- Developing countries can rely on foreign governments for technology transfer. The advantage of this approach is that the donors actively try to promote technical assistance. The primary disadvantage is almost insurmountable, though: most of the technology that developing countries desire can be transferred only by the private sector. According to Japan's Ministry of Foreign Affairs, LDC requests for technical assistance are becoming increasingly sophisticated -- and therefore increasingly difficult for the government to meet (see Table 1). Much of the technology listed in the table depends on the private sector's willingness to transfer knowledge and skills. Although government assistance programs can provide some training and expert assistance, MFA readily admits that its programs alone cannot satisfy developing country demands.

Table 1: Trends in Developing Countries' Requests for Japanese Technical Assistance

Past	Present
vocational training	remote sensing technology
agricultural development	new energy development
forestry development	computer technology
urban transportation controls	biotechnology
medical cooperation	biogenetic resources research
	management control
	productivity improvement
	measuring standards
	quality control
	patented information

Source: Ministry of Foreign Affairs

The first and fourth options listed above are those on which LDCs rely most heavily. Government technical assistance is welcome, especially since it is given on concessional terms. But the countries also recognize that the best source of the technology they desire is through foreign direct investment. Technology transfer most commonly occurs in this form when multinational corporations train managerial and professional employees, who later leave the MNCs to work for domestic firms or other organizations. This kind of turnover yields a double benefit; not only do the newly trained employees bring their skills to domestic organizations, but the MNC also must train new people to fill the vacated positions.

Japanese Suppliers: Motivations and Capabilities

In addition to its assertion that aid to the developing world is the "price the nation must pay in order to fulfill its international responsibilities as a major economic power and to promote and preserve world peace and stability,"[2] the Ministry of Foreign Affairs stresses another reason for its technical assistance programs. "Technical cooperation is also an important measure to show Japan's willingness to grant assistance to those countries that do not qualify for financial assistance."[3] Under the guidelines established by OECD's DAC, countries with per capita incomes above a certain level do not qualify for foreign aid, while those with severe debt-servicing difficulties are ineligible for new loans. These limits cover many oil-producing countries as well as a number of Latin American countries. At the same time, official Japanese discussions of aid policy recognize the value of technical assistance for the least developed countries. Because these countries cannot absorb large amounts of financial assistance, aid in the form of person-to-person training can supplement monetary contributions.

Officials, recognizing the public sector's limits, point out that the real strengths in technical assistance are in the private sector, which possesses more sophisticated knowledge and financial resources than do government agencies, as well as a finely tuned sense of how to operate in a competitive world. Thus, when developing countries request technical assistance in such areas as export promotion or advanced technologies, Japanese aid agencies are uncomfortably aware that they are not in the best position to deliver.

Most businesses also are better qualified than government officials to judge what technologies are appropriate for a particular country's development needs. The question of "appropriate technology" is one of the most widely discussed issues among policymakers since the choice of a technology -- vis-a-vis suitable opportunities for its use -- has a critical impact on successful development. Japanese firms, which tend to be vigilant in finding ways to maximize performance amid competitive conditions, are in a good position to give advice regarding appropriate technology.

But it is difficult to think of specific incentives for Japanese firms to actively promote technology transfer to the Third World. Analysts have outlined several reasons why such transfers are in the best interests of First World industries:[4]

- Technology transfer (almost by definition) expands the capabilities of Third World countries. This can lead to economic growth in developing country markets, thereby expanding markets.

[2]Keisuke Arita, "Japan's Technical Cooperation with the Developing Countries," Journal of Japanese Trade and Industry, No. 2, March 1, 1985.

[3]Ministry of Foreign Affairs, Japan's Official Development Assistance (Tokyo: Association for the Promotion of International Cooperation, 1987), p. 106.

[4]See, for example, Leslie Dawson, "Transferring Industrial Technology to Less Developed Countries," Industrial Marketing Management, XVI, No. 4, November 1987.

• Industrial firms can cement their relations with resource-rich developing countries by facilitating transfers of technology. This can ensure continued access to strategic raw materials -- an issue that has been of driving concern to Japanese industries.

• Industries can use technology transfer as one means of protecting their investments. By expanding the skills and self-sufficiency of Third World countries, for example, Japan's private sector can reduce the possibility of widespread debt defaults. Furthermore, foreign companies can contribute to economic stability, which in turn can aid political stability, thereby reducing the risk that their existing investments will be nationalized.

• Technology transfer can be used as a kind of goodwill "insurance," based on the premise that an underdeveloped country that receives help and makes significant economic progress (similar to the current situation in Asia) might be predisposed favorably toward its benefactor in future global power shifts. In such a case, First World firms will have had the foresight to enhance solid political and economic relations.

• The private sectors of industrial countries have a "moral imperative" to aid the economies of less developed countries, according to some theorists. Quite simply, this view says that the more fortunate have a duty to share their knowledge and skills with the less fortunate, thereby facilitating their economic growth and transition to self-sufficiency.

These benefits of technology transfer all may be valid, but they do not reflect the actual motives of the private sector. Since technology transfer usually occurs via direct investment, it is useful to examine first the motives for investment and then the connection between investment and technology transfer.

The moral imperative argument is especially optimistic. Firms simply do not base their investment decisions on broad considerations like North-South inequities. They act out of self-interest. And although Japanese firms are known for their willingness to sacrifice short-term gains for a longer term payoff, they nonetheless take a shorter term view than the need to prepare for possible world power shifts (reason four).

Regarding the third point, most firms do not believe that the way to protect current investments is through technology transfer or increased investments in unstable countries. Whether or not this strategy could help stabilize an investment environment, it does not make sense for a firm to protect itself by increasing its current risks. There is, for example, a real fear among some Japanese industries of "throwing good money after bad." In fact, rather than sinking money in developing countries to foster a secure investment climate, Japanese firms have pulled out of unstable developing regions (especially the Middle East and sub-Saharan Africa). Industrialized countries offer a sound alternative; consequently, Japanese firms' investment dollars are flowing more and more today to the United States and Europe.

Still, there are concrete reasons for investing in developing countries. Not least among these is the fact that labor costs in LDCs are significantly lower than in Japan and other industrialized countries. Especially since the rise in the value of the yen following the Plaza Accord of September 1985,

Japanese firms have had substantial cost incentives to engage in foreign investment. Thus, the absolute value of Japanese investment has increased almost across-the-board (see JEI Report No. 23B, June 17, 1988). In the developing world, countries in Asia and Latin America have been the primary beneficiaries.

In short, private firms -- whether in Japan or any other country -- make foreign investments only if they expect to see a concrete gain. In this respect, the first and second points above are well-taken: Japanese firms do take export opportunities and natural resource availability into account when making investment and technology transfer decisions. For example, a 1981 survey of Japanese industries in Brazil revealed that firms tend to have relatively short-term and tangible reasons for investing there. (It should be noted that the survey asked Japanese investors why they "transfer technology" to Third World countries; however, the context of the survey indicates that "transfer technology" was used as a synonym for "invest.")

The four most commonly cited reasons (in no particular order) were: to develop or defend local markets for Japanese goods; to acquire and assure the supply of raw materials; to search for low-cost production sites; and to escape the space constraints that limit industrial expansion in Japan. Other less commonly cited reasons included: to assure the continuance of Japanese exports to the host country; to avoid the constraints posed by strict pollution control laws in Japan; and to follow the lead of a competitor firm.[5]

Transferring production activities inevitably leads to some transfer of technology to the host country. However, does Japanese willingness to invest in developing countries necessarily translate into a willingness to transfer technical knowledge and skills to those countries? The answer is no -- or at least not necessarily. Certainly the training of local employees for positions of responsibility in the firm has advantages. Local employees have language skills and local knowledge that are indispensable to the Japanese firm. But Japanese investors fear that too much training or knowledge-sharing will come back to haunt them. As developing countries acquire more technology, they attain a greater level of self-sufficiency. When this happens, the host country may cease being a market for Japanese products. Worse yet from the Japanese viewpoint, indigenous firms may utilize the transferred technology so effectively that they begin to compete head-to-head with Japan -- in much the same way that Japanese firms acquired and adapted foreign technologies to challenge Western preeminence in international markets.

This "boomerang effect" already has struck some Japanese firms. For example, Japanese steel firms cooperated with South Korean firms in establishing the Pohan steel works. Korean firms were so pleased with the project that they suggested expanding the cooperation to other projects. Japanese steel companies were not enthusiastic; the Pohan venture had allowed South Korean steel producers to become competitive vis-a-vis their Japanese counterparts. Korean firms now supply Japan with some of their steel -- and at prices 7 to 15 percent cheaper than Japanese steel of comparable quality.[6]

[5]Charles H. Smith III, Japanese Technology Transfer to Brazil (Ann Arbor, Michigan: UMI Research Press, 1981), p. 43.

[6]Akira Kubota, "Transferring Technology to Asia," Japan Quarterly, XXXIII, No. 1, January-April 1986, pp. 38-39.

Not surprisingly, the more sophisticated the technology involved, the more reluctant Japanese firms are to transfer it, especially to countries that have the potential to challenge Japanese producers. Technology represents competitiveness -- the ability to create or maintain state-of-the-art products and production methods. It is a commodity that is bought and sold internationally, not given away lightly.

Thus, despite the political and diplomatic pressure on Japan to be generous in facilitating technology transfer, the Japanese private sector has few incentives to do so. Even when there is a specific gain to be made by transferring knowledge or skills, Japanese companies have learned from bitter experience to be cautious. They see technology transfer more as an unpleasant consequence of overseas investment than as a long-term goal.

Issues in Private Technology Transfer: A Comparative Perspective

Although Japanese firms are unlikely to transfer technology deliberately, the extent of their overseas investments makes transfers inevitable. It is virtually impossible, for example, to locate a firm overseas without hiring and training local employees. What is critical to a technology transfer, then, is how conducive the management and operations of Japanese overseas ventures are to the diffusion of technologies. Since "conduciveness" is difficult to measure, the best way to examine this question is perhaps to compare Japan to another country with technology to share. Do Japanese firms tend to transfer technology to a greater or lesser extent than other foreign investors? To this end, there have been a number of studies that compare U.S. and Japanese investment practices.

Charles Stewart Jr., who has conducted extensive research on U.S. and Japanese investment in developing countries, has argued that Japanese and U.S. industries traditionally have invested in developing countries for different reasons.[7] While U.S. investors have tended to establish manufacturing operations in the Third World with the intention of producing for local consumption, Japanese firms have been more likely to produce for export. Mr. Stewart argues that the export orientation of Japanese investors makes low labor costs an especially important drawing card in moving production offshore. Although cheap labor also has been attractive to U.S. investors, access to protected local markets has been more of a draw. The eventual market obviously affects the choice of products to be manufactured. Japanese overseas plants have concentrated on labor-intensive products that are relatively more expensive to produce in Japan, while U.S. firms have been more likely to focus on more sophisticated industries or services.

While Mr. Stewart may be correct in identifying a historical tendency, today's situation is not at all clear-cut. U.S. firms often shift offshore to take advantage of low-cost assembly and then ship those products to the United States. (Witness, for example, U.S. automotive companies' assembly operations in Mexico.) Similarly, Japanese firms by no means restrict themselves to reexporting the products they manufacture or assemble offshore. A common complaint

[7]Charles T. Stewart Jr., "Comparing Japanese and U.S. Technology Transfer to Less-Developed Countries," Journal of Northeast Asian Studies, IV, No. 1, Spring 1985, pp. 9-10.

among members of the Association of Southeast Asian Nations is that as much as they welcome Japanese investment, they want to see investment ventures that are targeted less at domestic markets and more toward exports. This, they say, would both improve their trade balances and expand their export know-how.

Another factor that complicates Mr. Stewart's argument is that U.S. firms had a head start on Japanese firms in setting up overseas operations. It is typical for businesses to begin foreign activities with uncomplicated ventures and move gradually to more sophisticated ventures. The least complicated type of offshore operation is one in which the investing firm utilizes cheap overseas labor to assemble components and then ships the assembled products back to the home market. Indeed, early U.S. investment in Third World countries concentrated heavily in this area. As investors gain experience with overseas locations, they often begin to produce as well as assemble components. This is precisely what has been happening with Japanese firms, which increasingly are deciding to establish offshore production for more sophisticated industries. As time goes on, then, American and Japanese patterns are likely to converge.

Some analysts argue that the U.S. tendency to invest in more sophisticated industries has had a negative impact on their effectiveness in tranferring technology. Professor Kiyoshi Kojima maintains that U.S. overseas investments involve technologies that are more complex and therefore difficult for LDCs to absorb. By contrast, he says, the technologies associated with Japanese investment are well-established and standardized -- that is, more appropriate for Third World development.[8]

A 1979 survey by the Economic Planning Board of the Korea Industrial Bank supports Professor Kojima's theory, at least in the case of South Korea.[9] Japanese and U.S. affiliates in South Korea were asked what factors inhibited the transfer of technology and management know-how to local Korean firms. U.S. affiliates were more likely than Japanese affiliates to attribute problems to a lack of capacity to absorb the information (see Table 2). Thus, there is some

Table 2: Reasons Given by Japanese and U.S. Affiliates in Korean Manufacturing Industries for Nontransfer of Technology

(percentage of affirmative answers)

	Japanese Affiliates	U.S. Affiliates
Lack of absorptive capacity	20%	50%
Restrictions imposed in the contract	20	17
Conscious attempt to prevent transfer	60	0
Other	0	33

Note: Respondents included 15 Japanese affiliates and six U.S. affiliates.

[8]Cited in Chung H. Lee, "Transfer of Technology from Japan and the United States to Korean Manufacturing Industries: A Comparative Study," Hitotsubashi Journal of Economics, XXV, No. 2, December 1984, p. 125.

[9]Ibid., p. 130.

evidence for the argument that Japanese technology is more appropriate for transfer than U.S. technology -- although this difference is likely to become marginal in the future.

The sophistication of the technologies involved is only one factor affecting the transferability of knowledge and skills. Another factor is the management and training practices of the investor. U.S. and Japanese firms have extremely different management policies. As discussed above, technology transfer has not occurred until the information or know-how has been communicated to the host country. The most common way for this to happen is for an employee of the foreign affiliate to leave his or her job in order to work for a domestic organization. If a foreign affiliate engages in extensive training of indigenous employees but retains these employees on a long-term basis, technology transfer can be significantly retarded. This is a good example of private investors' goals conflicting with the aims of technology transfer. It is in the best interests of the investor to train a limited number of employees and retain their services for as long as possible. Facilitation of technology transfer requires exactly the opposite: a stream of indigenous personnel who stay with the foreign affiliate just long enough to absorb relevant training or information.

Thus, it is important to examine the attitudes of Japanese and U.S. affiliates toward training and length of stay. Not surprisingly, Japanese firms place more emphasis on long-term employment than do U.S. firms. In fact, Japanese hiring practices emphasize a candidate's ability to fit into the group and the probability of staying with the firm as much as his or her professional qualifications. By contrast (and again, similar to hiring practices in the United States), American affiliates are more likely to focus on a candidate's education, performance on aptitude tests and other professional qualifications. Employees also find that Japanese management techniques are structured to encourage worker loyalty and "team spirit." According to Mr. Ozawa, some of these techniques include: ringi system of bottom-up decision-making and consensus-building; long-term job security (perhaps including lifetime employment); attempts to avoid layoffs if at all possible; wages based on seniority; bonus system; suggestion boxes; employee participatory meetings; company uniforms; job rotation; cultural and educational programs for employees; and fringe benefits (e.g., subsidized food or housing).[10]

Moreover, once an employee is hired, he or she finds that the chances of success in the firm also differ in American and Japanese affiliates. Japanese firms are more likely to promote from within, while U.S. firms are willing to hire candidates from outside the firm. Clearly, this increases the incentives for employees of U.S. affiliates to move on to other jobs. And in fact, researchers have concluded that the turnover of managerial and professional employees is greater in U.S.-affiliated firms. Thus, the ability of Japanese affiliates to retain indigenous employees actually reduces the rate of technology transfer to the host country.

Although Japanese firms are more willing to promote from within, employees find that the number of professional positions for which indigenous employees are eligible is limited. When Japanese ventures move offshore, so do a number of their Japanese professional employees. Consequently, managerial and

[10]Ozawa, op. cit., p. 30.

technical responsibilities are concentrated in the hands of Japanese expatriates. This decreases the amount of management experience and know-how that can be transferred to host developing countries.

The large proportion of Japanese expatriates filling positions of responsibility has generated complaints from ASEAN countries. For example, a series of country studies conducted under the auspices of the ASEAN Secretariat and the Japan Institute of International Affairs (in collaboration with the Institute of Southeast Asian Studies) revealed general discontent with the process of technology transfer from multinational firms to ASEAN countries.[11] Although this discontent appears to apply to multinationals regardless of nationality, Japanese firms were singled out for particular complaints. In one study, Thai researchers cited the limited access Thai firms had to the technical know-how and production technologies contributed by Japanese expatriates. In some Japan-Philippines joint ventures, the situation went even further: every Filipino manager was assigned a counterpart Japanese manager.

Thus, in terms of employee turnover and the number of responsible positions delegated to indigenous employees, Japanese firms appear to lag behind U.S. firms in technology transfer. Yet another factor enters in, however: the quality of training received by indigenous employees. Here again Japanese and U.S. firms show important differences. American firms tend to consider training as something for new employees. Moreover, U.S. training usually is conducted via formal channels, such as classes and published materials. By contrast, Japanese firms view training as an ongoing process for employees, usually rendered in an informal or on-the-job setting.

Admittedly, Japanese on-the-job training often is not as generally applicable as the more formal kind. It has been argued that because Japanese training is more specific and situational, it is less transferable than U.S. training. This may or may not be the case. Informal training relies more on person-to-person contacts and therefore can be tailored to meet an employee's particular needs. Moreover, without the give-and-take of informal training, it is difficult to tell how much of the U.S. firms' classroom or manual training is lost on the trainees. The very fact that Japanese firms believe that training should last throughout the employee's tenure augurs well for the likelihood that the employee will absorb technical know-how.

Another difference in training policies is that Japanese firms are more likely to send indigenous employees overseas (often to Japan) for training than are U.S. companies. Nor do Japanese firms limit overseas training opportunities to professional employees (as U.S. firms generally do); production workers also are sent. Training in Japanese firms applies to everyone involved in the production process.

While this policy stems from the Japanese expectation (or at least hope) that employees will remain with the firm on a long-term basis, its effect is to encourage employees with marketable skills to accept more lucrative offers. It is true that Japanese overseas firms experience less turnover than do U.S. firms. But the turnover is not as low as Japanese investors would like it to be. Training, an integral and ongoing part of the production process in

[11] C.Y. Ng, R. Hiron, and Robert Y. Siy Jr., Technology and Skills in ASEAN: An Overview (Singapore: Institute of Southeast Asian Studies, 1986).

Japanese firms, often backfires in overseas operations by enabling (even encouraging) employees to take their marketable skills elsewhere. As such, training is perhaps the most vital element of Japanese technology transfers to LDCs.

At a more general level, the study conducted by the ASEAN Secretariat and the Japan Institute of International Affairs concluded that when potential Western and Japanese investors negotiate with host LDCs, they take two very different approaches to technology transfer. U.S. and other Western firms make technology transfers more explicit than do Japanese firms. For example, U.S. firms often conclude contracts that outline which operating manuals will be provided to the host country. Technical guidance and personal assistance is available, but it usually is provided only when the recipient country's experts cannot understand the specifics of the manuals. By contrast, Japanese firms take a "package approach," in which they do not draw up detailed specifications regarding the nature of the transfer. This approach has generated developing country concerns regarding whether Japanese firms are serious about transferring technology, including complaints that Japanese firms deliberately prevent such transfers from taking place. (See Table 2 above, which demonstrates the perceptions in South Korea that Japanese firms consciously obstruct technology transfers to local Korean firms.)

Japanese analysts respond by arguing that because their approach is less explicit, it is better in the long run. Since Japanese industries tend to make more general agreements, they say, transfers go significantly beyond the contract specifications and "Japanese firms can thus be considered to be much more generous in providing technologies than their Western counterparts."[12]

The Importance of Small and Medium Firms

Since there are no immediate incentives for the private sector to make technology transfer a goal, the Japanese government has searched for ways to encourage private overseas investment to developing countries -- arguing that such investment would lead inevitably to technology transfers. More and more emphasis is being placed on the contributions that can be made by Japanese small and medium-sized firms.

There are a number of reasons for this. For one, large Japanese firms located in developing countries often have no need to subcontract work since they have the capacity to perform all necessary tasks within the firm. In these cases technological knowledge associated with production stays within the Japanese company itself. Small and medium-sized firms often have no option but to subcontract some portions of their production -- a situation that generates opportunities for local firms to gain contracts as well as technical knowledge.

Second, smaller firms often are more willing to participate in joint ventures with local investors than are larger firms. Clearly, if local firms have an equity in the venture, they will have a greater chance of participating in decisions regarding management and production techniques. Third, the investments that small and medium-sized companies make in Third World countries are often in industries that take advantage of low labor costs. Labor-intensive ventures require management techniques that focus on employee satisfaction and

[12] Ibid., p. 111.

productivity -- a bottom-up management approach to labor relations. Consequently, training for skilled and semiskilled workers must be integral to a venture.

Japan is the only industrial nation to date whose small and medium-sized firms have shown significant interest in investing overseas. U.S. investors, for example, consist primarily of multinational companies. Nonetheless, a number of constraints work against investment by small and medium-sized firms. For example, developing country governments have tended (at least until recently) to view investment by large businesses as the way to industrialize. As a result they have offered few investment incentives to small or medium-sized firms. On the investor side, the smaller the firm, the less likely that it can bear the risks associated with overseas investment. Nor do smaller firms usually have personnel with enough experience and training to negotiate with potential host countries. This constraint has been mitigated somewhat for Japanese firms, however, since Japanese trading companies can assist small and medium-sized firms in identifying investment opportunities and intermediating between the host country and the potential investor.

Whether small and medium-sized investors will deepen their commitment to developing countries is uncertain. On the pessimistic side, as Japan's small and medium-sized firms become more sophisticated, they are moving away from labor-intensive production. This clearly reduces the importance of developing countries' low labor costs. Moreover, small and medium-sized firms are especially vulnerable to the effects of political and economic instability in the host country. Like their larger counterparts, they are finding more attractive investment opportunities in developed regions.

On the optimistic side, the strength of the yen is likely to encourage small and medium-sized firms to invest in both developed and developing countries. Government officials also are searching for ways to encourage investment in LDCs. For example, the Japan External Trade Organization and the Ministry of International Trade and Industry's Small and Medium Enterprise Agency now provide information and consulting services to small and medium-sized firms regarding the investment climate in developing countries.

Barriers to Private Technology Transfer

While the most fundamental constraint against private technology transfers to LDCs is that Japanese firms have virtually no incentive to do so, other barriers also pose problems to those willing to invest. They fall into three general categories: infrastructure, culture and legal constraints.

Infrastructure - The problems of infrastructure need little elaboration. If Japanese firms use sophisticated technologies, the recipient country may not have the personnel or facilities to incorporate the new knowledge. Policymakers in developing countries often complain that the technology foreign investors bring to their overseas ventures is inappropriate to the host country's needs. Most often, the technologies are too capital-intensive to be used effectively by indigenous industries. But LDCs also express frustration at another problem. Thai researchers, for example, have argued that foreign firms have transferred second-hand, practically obsolete equipment as "labor-intensive, appropriate technology."[13] In reality, the high maintenance costs of such equipment offset the positive benefits to the recipient country's economy.

[13] Ibid., p. 22.

Related and equally important is the notion of technological dependence. As much as most developing countries welcome foreign investment as a way to speed economic growth, they remain cautious. To exaggerate slightly, LDCs believe that technology transfer can be used as an economic weapon. They argue that technology transfer contracts usually are concluded to the advantage of the supplier rather than the buyer. The recipient's limited knowledge of the technology itself complicates an evaluation of its worth or -- perhaps more important -- an analysis of possible alternatives to the technology. Consequently, LDCs charge, the agreements made between developed and developing countries are written in such a way as to perpetuate the recipient's dependence on the supplier for technical assistance.

Culture - Some analysts have called cultural barriers the greatest challenge to the successful transfer of technology. For the Japanese especially, barriers to communication -- either lack of language skills or cultural awareness -- have created significant problems for Japan's relations with other countries. The Ministry of Foreign Affairs recently acknowledged this problem, saying that it is "not easy to expand technical cooperation . . . especially in Japan's case, because cooperation requires international understanding by the whole nation."[14]

Legal Constraints - Japanese businessmen often cite problems with the restrictions that developing countries place on private investors -- such as strict domestic content laws. Thailand, for example, has imposed tariffs on much of the inputs and equipment imported by investor firms. Lack of legal protection is as much a problem as legal restrictions. Investors have been quite uncomfortable with the weak protection that some developing countries -- especially some Southeast Asian countries -- provide to patents and trademarks.

But the restrictions are hardly only on the recipient's side. When Japanese or other foreign firms negotiate with developing countries regarding potential investments or technology sales, the supplier often places restrictions on the possible uses of the technology. For example, a technology transfer is sometimes tied to the purchase of raw materials or intermediate inputs. Alternatively, acquisition of technologies sometimes is contingent on a promise that the recipient will not export the resulting product.

Public Technology Transfer

Although private investment accounts for the bulk of technology transfer, certain transfers are arranged for other-than-profit reasons. The government is overwhelmingly the most important actor in this category. (Although the activities of Japanese nonprofit organizations have been expanding in recent years, they are still minimal compared to those of the United States.) MFA defines technical cooperation as a form of official development assistance that "teaches and transfers technologies, skills and knowledge which are important for the development of human resources, and thus contributes to the development of developing countries."[15] Officials stress that the "essence" of this cooperation is the focus on human resources.

[14]Ministry of Foreign Affairs, op. cit., pp. 113-114.

[15]Ministry of Foreign Affairs, op. cit., p. 105. See also Japan International Cooperation Agency, Annual Report 1988 (Tokyo: Japan International Cooperation Agency, 1988).

Tokyo has been attempting to expand its technical cooperation efforts, especially since technical assistance as a percentage of Japan's official development assistance is only about half the amount given by several other DAC members. For example, in 1985 technical cooperation made up 11.1 percent of Japanese aid -- as compared to 38.1 percent for France, 29.8 percent for West Germany and 21.8 percent for Great Britain.[16]

Most public technical cooperation is implemented by the Japan International Cooperation Agency, a semigovernmental organization formed in 1974 to administer technical cooperation programs and emigration services. The Japan Overseas Cooperation Volunteers -- Japan's equivalent of the Peace Corps -- also is coordinated by JICA. Moreover, JICA's functions have expanded in the past several years to include overseas disaster relief. JICA divides technical cooperation into three major categories: accepting trainees and students; dispatching experts; and providing equipment and machinery. JICA also engages in "project type cooperation," which involves ventures that incorporate all three areas of technical cooperation.

By running training programs JICA hopes to transfer technologies or knowledge to people so that "they can take an active part in the economic and social development of their countries."[17] Since 1954, when the first trainees were brought to Japan, MFA estimates that 62,000 trainees have been accepted. Note, however, that this figure describes only the number of trainees accepted, not those who actually attended training sessions. Trainees consist of a variety of people, including administrative officers, researchers and middle-level technicians from the public and the private sectors of developing countries.

Although most of the trainees are accepted for training in Japan, this is not always the case. In 1975 JICA established a "Third Country Training Program," in which developing countries receive trainees from neighboring LDCs. The aim is to increase technical cooperation among developing countries with similar physical, social, cultural and/or economic environments. As of FY 1986 this program had been carried out in 15 countries: Thailand, Singapore, Indonesia, the Philippines, Malaysia, South Korea, Chile, Costa Rica, Peru, Brazil, Egypt, Kenya, Ivory Coast, Fiji and Papua New Guinea.

Experts dispatched to developing countries often work at research institutes, government offices, project centers and vocational training centers, among others. MFA estimates that Japan sent 10,579 experts to developing countries between FY 1955 and FY 1986. JICA officials admit that this kind of technical assistance is one of the most difficult to implement successfully. The need for person-to-person communication obviously requires that JICA find willing and qualified people to help in training activities. But this is easier said than done. Japan's so-called lifetime employment system limits the flexibility of qualified individuals to devote a few years to government service. Additionally, aid officials note that Japanese people often admit to feeling uncomfortable in dealing with foreigners. Those who spend significant amounts of time abroad often experience feelings of no longer "fitting in" when they return to Japan. This situation has been changing, but such change comes slowly.

[16]Ministry of Foreign Affairs, op. cit., p. 106.

[17]Ministry of Foreign Affairs, op. cit., p. 108.

Even those willing to go overseas often are plagued by language barriers and cultural dissonance. MFA has noted, "Compared with Western Europe and America, Japan does not have a sufficient number of talented people with rich experience in living abroad, including proficiency in foreign languages."[18] Consequently, JICA sets aside a certain amount of its budget to attract and train qualified personnel through such programs as the Institute for International Cooperation, created in 1983 to recruit and train Japanese experts for careers in technical cooperation. Similarly, JICA's Youth Invitation Program (which is categorized as a training activity) appears to be designed as much for Japan's benefit as for the LDC participants. The program arranges opportunities for Asians between the ages of 18 and 35 in a number of occupations to meet with Japanese counterparts and exchange ideas. While this does not necessarily lead to actual technology transfers, the program is expected to pave the way for future aid efforts.

The third type of government technical cooperation is the provision of machinery and equipment. Tokyo has recorded 831 cases of this kind of assistance, amounting to Y13.8 billion ($106.2 million at Y130=$1.00) since Japan began providing machinery to developing countries in 1964. Although developing countries obviously gain the opportunity to study and evaluate this machinery, many of the poorer countries do not have the human resources to do so. Consequently, the provision of machinery is recognized as the least likely form of technical cooperation to actually transfer knowledge or skills to LDCs.

Finally, there is "project type cooperation," that is, multiple-year assistance that combines training, the dispatch of experts and the provision of machinery and equipment. Tokyo has been criticized for emphasizing project-type cooperation at the expense of basic human resources development since Japan's technical cooperation remains more project-oriented and capital-intensive than that of other DAC countries (see JEI Report No. 46B, December 11, 1987). It has been said, for example, that there is an unintentional division of labor between JICA and the U.S. Agency for International Development. Whereas AID gears technical assistance toward improving the capacity of developing countries to absorb expertise (through basic education and research support activities), JICA tends to focus on industry-specific skills.

Unfortunately, this difference has perpetuated the negative portrayal of Japanese aid as a vehicle to gain markets for Japanese goods. Since project aid may be related to the needs of Japanese businesses, large projects often generate business for Japanese contractors. Moreover, the training involved with project aid tends to be less generally applicable than broader technology transfer attempts. Consequently, Tokyo has begun to move away from project aid in favor of assistance to educational and research institutions.

Conclusion: Bringing the Private and Public Sectors Together

The most basic obstacles facing Japanese technology transfer to developing countries are the private sector's unwillingness to transfer technology and the limited value of government assistance in meeting the entire gamut of LDC technological needs. An optimal solution would be to use private resources

[18]Association for the Promotion of International Cooperation, A Guide to Japan's Aid. (Tokyo: Association for the Promotion of International Cooperation, 1987), p. 35.

(especially knowledge and skills) to make public technical cooperation efforts more responsive to developing country needs. JICA has attempted to encourage public-private interaction by establishing a "development cooperation program," which provides assistance to Japanese private-sector projects in developing countries that contribute to the development and welfare of the recipient.

Tokyo also has set up guarantee programs to encourage Japanese investment in Third World countries. Moreover, Japan's Overseas Development Corp. provides interest-free, long-term loans to Japanese firms that wish to establish joint ventures (with minority ownership) in developing countries where Japanese investment is still small. At the international level Japan was the first industrialized country to ratify the convention that established the Multilateral Investment Guarantee Agency, created by World Bank members and Switzerland to issue guarantees against noncommercial risks to participants that invest in a member developing nation (see JEI Report No. 22B, June 12, 1987).

Tokyo also has created incentives for firms to export technology to the Third World. For example, 70 percent of a firm's profits on technology exports are excluded from its taxable income. More generally, for technology exports under the Export Insurance Law of 1950, exporting firms can pay an insurance premium to the Ministry of International Trade and Industry; in return, they are protected from the possibility of an importer's default on the contract.

An effective combination of private resources and government initiatives will be difficult to forge, but the idea has much appeal in Tokyo's government circles. Aid policymakers are quick to point out that Japan's huge current account surplus lies in the private sector, while the government has been operating under stringent budget constraints for several years. As a result, policymakers have been searching actively for innovative ways to stimulate public-private cooperation. The most publicized attempt was the 1987 announcement of a $20 billion plan to recycle a part of Japan's current account surplus directly to major debtor countries. Although the plan did not generate as much private participation as government officials had hoped, it was a good high-profile step toward integrating public and private initiatives in the Third World.

What is more important, the plan highlighted Tokyo's conviction that economic aid must be reinforced by private investment and trade if it is to be successful. The private sector's participation is especially crucial if technical assistance is to be effective. Thus, if developing countries continue to demand increasingly sophisticated technologies from aid donors, Tokyo is likely to set up more initiatives that combine government and private-sector resources to address Third World development problems. If such initiatives are successful in transferring appropriate knowledge and skills to LDCs, Tokyo will have gone far in demonstrating its commitment to aid quality as well as aid quantity.

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The views expressed in this report are those of the author and do not necessarily represent those of the Japan Economic Institute.